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BULK REARING OF SCOLYTUS MULTISTRIATUS MARSH.

AND HYLURGOPINUS RUFIPES EICH. X

Charles L. Griswold, ^{Louis} 1900-
Division of Forest Insect Investigations

In connection with research associated with the Dutch elm disease control program, large numbers of Scolytus multistriatus Marsh. (fig. 1) and Hylurgopinus rufipes Eich. (fig. 2), the two principal vectors of the Dutch elm disease fungus, Ceratostomella ulmi Buisman, were required for experimental use throughout the year at Morristown, N. J. This was especially true of S. multistriatus, the more important vector, in testing the control value of DDT and other insecticides. Field-collected material proved unsatisfactory, for it was difficult to obtain sufficient quantities, either in the proper developmental stage or in pure cultures. A method was finally adopted whereby adults of both species were reared in the laboratory by artificially infesting American elm wood under controlled conditions.

Rearing Room

A room in the laboratory cellar was especially constructed and fitted with shelves to accommodate a series of rearing containers. Adequate heat was supplied throughout the year by hot-water radiators connected with a coal-fired pot stove located just outside the room. Since both species of bark beetles are positively phototropic, electric outlets were provided to furnish the lighting required for attracting emerging beetles to collection bottles.

Rearing Containers

Two types of rearing containers, differing principally in size, were employed. Although both could be used for rearing Scolytus multistriatus, the smaller type (fig. 3) was easier to handle. In the rearing of Hylurgopinus rufipes, however, the larger type was used.

The smaller rearing container (fig. 3) was fashioned from a standard 5-gallon, open-top metal paint can with a recessed metal lid. A narrow rubber gasket was glued to the under edge of the metal lid, and a metal friction rim was applied over the closed edges of the can and lid. To permit the attachment of a fixture for holding collection bottles, and to admit light for beetle attraction, a hole 3 inches in diameter was cut in one side, just above the center of the can. The fixture consisted of the threaded metal cover of the bottle used for

the collection of beetles. Most of the cover was removed, and the threaded rim remaining was attached over a 1-1/4-inch circular hole in the center of a 4-3/8-inch disk of metal through which numerous holes smaller than the beetles had been punched. The threaded rim was attached to the metal disk by crimping the cut edge of the rim over the edge of the large hole in the disk. In turn this assembly was fitted over the 3-inch hole in the side of the can and held in place by a circular metal band, 5/8-inch wide with an outside diameter of 4-3/8 inches, riveted to the can. The beetle-collection bottles were of the square, wide-mouth, screw-top type, 4-1/4 by 1-3/4 by 1-3/4 inches. They were threaded so that they fitted into the fixture and could be fastened tightly by a three-quarter turn.

The larger rearing container was made from an ordinary metal ash can, approximately 24 inches in height and 15-1/2 inches in diameter, with metal handles on the sides. A band of sponge rubber, arranged to fit the rim of the can, was glued to the underside of a wooden cover. Strong coil-wire springs attached to the metal handles and to the edges of the wooden cover insured a tight fit. On one side of the can four holes 3 inches in diameter were cut in a zigzag pattern from within a few inches of the top to within a few inches of the bottom. Fixtures similar to those used for the smaller type of rearing container were fitted over these holes to hold beetle-collection bottles.

REARING TECHNIQUE

Scolytus multistriatus Marsh.

Success in the reproduction of Scolytus multistriatus in the rearing room was dependent largely on the condition of host wood used at the time of beetle introduction and on the temperature to which it was exposed afterwards. Good results were obtained by the introduction of beetles on partially seasoned wood only. Neither freshly cut wood nor wood with very dry bark was found satisfactory. Beetles developed satisfactorily at a temperature of about 78° F. and in a humidity range from 50 to 60 percent—conditions that usually obtained in the rearing room.

By the rearing methods outlined below, a good reproduction rate was obtained, amounting in some instances to as high as 15 times the number of beetles originally introduced, and a constant beetle supply was assured.

The technique was as follows:

(1) Freshly cut sections of American elm, 3 to 5 inches in diameter, were sawed into lengths of approximately 12 to 24 inches, depending on the size of the rearing container to be used. The sections were partly dried by exposing the shorter ones to a temperature of about

78° F. for 10 days, and the larger ones to the same temperature for 15 days.

(2) The partly dried sections were placed in the rearing containers in an upright position, care being taken not to obstruct the fixture openings. The openings were closed temporarily with plugs.

(3) Beetles were introduced at the rate of 50 per square foot of bark surface. The covers were placed on the containers and allowed to remain there for 3 days to keep the interiors dark and thus encourage an even beetle distribution throughout the containers.

(4) At the end of this time cloth covers were substituted for the metal or wooden covers and allowed to remain for 5 weeks to permit further drying of the bark.

(5) The cloth covers were then replaced with the original covers. Since the beetles had usually begun to emerge by this time, the plugs were removed from the insertion fixtures, and collection bottles fitted in. Emergence continued thereafter for 4 to 5 weeks or longer.

(6) Once emergence had begun, electric lights were used during the day and turned off at night. The heat and light in the room caused considerable beetle activity within the bottles, and since overcrowding caused the beetles to injure each other, they were removed from the bottles three or four times daily.

(7) Beetles that were not to be used immediately were transferred to other bottles of a similar type and size, into which some material such as a folded filter paper had been inserted to furnish a surface to which they could cling. These bottles, furnished with cloth covers to provide aeration, were then stored in a cool, dark place. As many as 400 beetles per bottle could be kept in good condition in this manner for about 3 days.

Hylurgopinus rufipes Eich.

For the reproduction of Hylurgopinus rufipes better results were obtained by the use of larger pieces of host wood than were used for Scolytus multistriatus, elm sections 4 to 5 inches in diameter and about 24 inches in length being used. Elm wood used for this species did not require partial seasoning before beetle introduction. Seasoning was required afterwards for about 4 weeks in the rearing room, however, and during this period the cans were provided with cloth covers. The cloth covers were then removed and replaced by the wooden ones, which were used until emergence was completed. The wood in the containers was infested at the rate of 100 beetles per square foot of bark area.

Since Hylurgopinus rufipes required a longer period for development than Scolytus multistriatus, progeny did not begin to appear in the collection bottles until about 8 weeks after the parent beetles had been introduced on host wood; but they often continued to emerge for 8 weeks thereafter. As the adult beetles of this species did not injure each other when crowded, it was unnecessary to remove them from the collection bottles so frequently as the S. multistriatus. As a result the emerging beetles, if not used at once, could be stored in the same manner as S. multistriatus but in somewhat greater numbers per bottle and for a slightly longer period.

In other respects the rearing methods and technique were similar for both species.

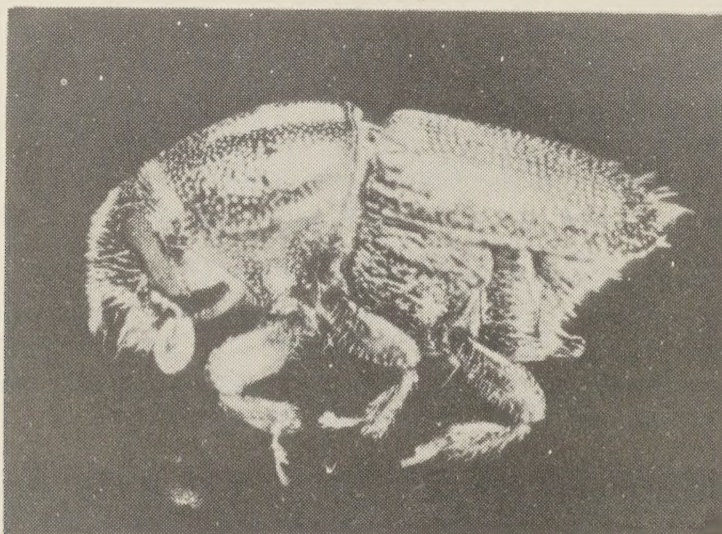


Figure 1.--Scolytus multistriatus adult.

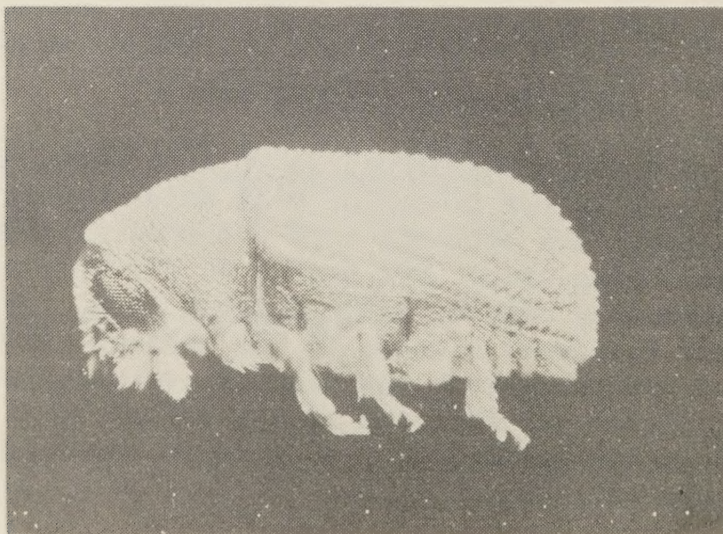


Figure 2.--Hylurgopinus rufipes adult.

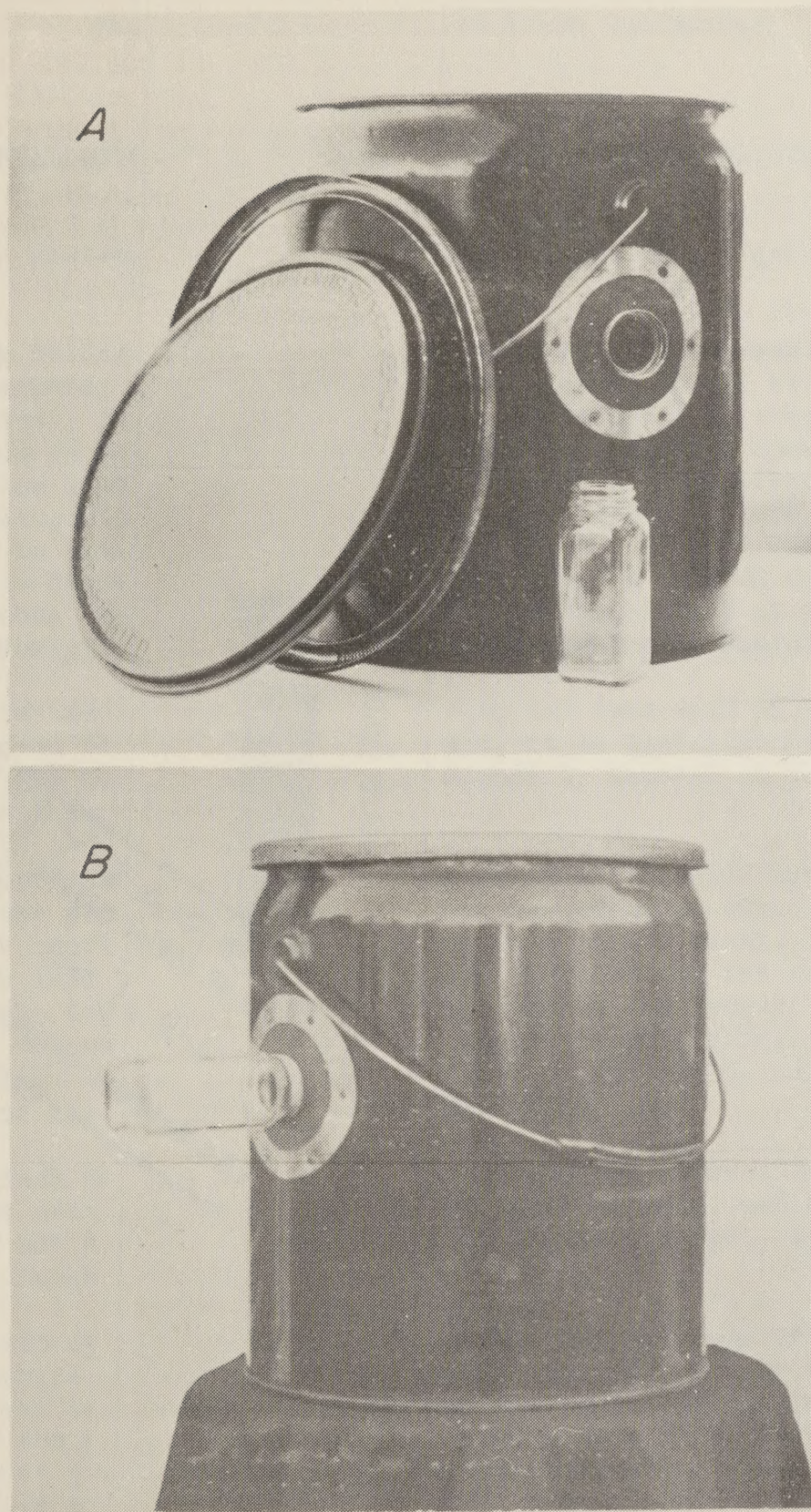


Figure 3.--Smaller rearing container: A, Unassembled; B, assembled.

